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09/608,354	06/29/2000	Donald Hooper	10559/222001/P8715	8914

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FISH & RICHARDSON, PC
12390 EL CAMINO REAL
SAN DIEGO, CA 92130-2081

EXAMINER	
EDELMAN, BRADLEY E	

ART UNIT	PAPER NUMBER
2153	11

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/608,354	HOOPER, DONALD	
	Examiner	Art Unit	
	Bradley Edelman	2153	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 March 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *23-35* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *23-35* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *29 June 2000* is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

This office action is in response to Applicant's request for continued examination filed on March 19, 2004. Claims 23-35 are presented for further examination. Claims 23-35 are all new claims.

Drawings

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. The current claims include various features that are not shown in the drawings, such as: the specific pointers and entries mentioned in claims 23-25, and 28-30; and accessing two trie tables in parallel as claimed in claim 28. Therefore, the details of the claims must be clearly shown in the drawings or the feature(s) canceled from the claim(s). No new matter should be entered.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

Content of Specification

(a) Title of the Invention: See 37 CFR 1.72(a) and MPEP § 606. The title of the invention should be placed at the top of the first page of the specification unless the title is provided in an application data sheet. The title of the invention should be brief but technically accurate and descriptive, preferably from two to seven words may not contain more than 500 characters.

(b) Cross-References to Related Applications: See 37 CFR 1.78 and MPEP § 201.11.

(c) Statement Regarding Federally Sponsored Research and Development: See MPEP § 310.

(d) Incorporation-By-Reference Of Material Submitted On a Compact Disc: The specification is required to include an incorporation-by-reference of electronic documents that are to become part of the permanent United States Patent and Trademark Office records in the file of a patent application. See 37 CFR 1.52(e) and MPEP § 608.05. Computer program listings (37 CFR 1.96(c)), "Sequence Listings" (37 CFR 1.821(c)), and tables having more than 50 pages of text were permitted as electronic documents on compact discs beginning on September 8, 2000.
Or alternatively, Reference to a "Microfiche Appendix": See MPEP § 608.05(a). "Microfiche Appendices" were accepted by the Office until March 1, 2001.

(e) Background of the Invention: See MPEP § 608.01(c). The specification should set forth the Background of the Invention in two parts:

(1) Field of the Invention: A statement of the field of art to which the invention pertains. This statement may include a paraphrasing of the applicable U.S. patent classification definitions of the subject matter of the claimed invention. This item may also be titled "Technical Field."

(2) Description of the Related Art including information disclosed under 37 CFR 1.97 and 37 CFR 1.98: A description of the related art known to the applicant and including, if applicable, references to specific related art and problems involved in the prior art which are solved by the applicant's invention. This item may also be titled "Background Art."

(f) Brief Summary of the Invention: See MPEP § 608.01(d). A brief summary or general statement of the invention as set forth in 37 CFR 1.73. The summary is separate and distinct from the abstract and is directed toward the invention rather than the disclosure as a whole. The summary may point out the advantages of the invention or how it solves problems previously existent in the prior art (and preferably indicated in the Background of the Invention). In chemical cases it should point out in general terms the utility of the invention. If possible, the nature and gist of the invention or the inventive concept should be set forth. Objects of the invention should be treated briefly and only to the extent that they contribute to an understanding of the invention.

(g) Brief Description of the Several Views of the Drawing(s): See MPEP § 608.01(f). A reference to and brief description of the drawing(s) as set forth in 37 CFR 1.74.

(h) Detailed Description of the Invention: See MPEP § 608.01(g). A description of the preferred embodiment(s) of the invention as required in

37 CFR 1.71. The description should be as short and specific as is necessary to describe the invention adequately and accurately. Where elements or groups of elements, compounds, and processes, which are conventional and generally widely known in the field of the invention described and their exact nature or type is not necessary for an understanding and use of the invention by a person skilled in the art, they should not be described in detail. However, where particularly complicated subject matter is involved or where the elements, compounds, or processes may not be commonly or widely known in the field, the specification should refer to another patent or readily available publication which adequately describes the subject matter.

(i) Claim or Claims: See 37 CFR 1.75 and MPEP § 608.01(m). The claim or claims must commence on separate sheet or electronic page (37 CFR 1.52(b)(3)). Where a claim sets forth a plurality of elements or steps, each element or step of the claim should be separated by a line indentation. There may be plural indentations to further segregate subcombinations or related steps. See 37 CFR 1.75 and MPEP § 608.01(i)-(p).

(j) Abstract of the Disclosure: See MPEP § 608.01(f). A brief narrative of the disclosure as a whole in a single paragraph of 150 words or less commencing on a separate sheet following the claims. In an international application which has entered the national stage (37 CFR 1.491(b)), the applicant need not submit an abstract commencing on a separate sheet if an abstract was published with the international application under PCT Article 21. The abstract that appears on the cover page of the pamphlet published by the International Bureau (IB) of the World Intellectual Property Organization (WIPO) is the abstract that will be used by the USPTO. See MPEP § 1893.03(e).

(k) Sequence Listing, See 37 CFR 1.821-1.825 and MPEP §§ 2421-2431. The requirement for a sequence listing applies to all sequences disclosed in a given application, whether the sequences are claimed or not. See MPEP § 2421.02.

1. The disclosure is objected to because it lacks a brief summary of the invention, and thus fails to comply with 37 CFR 1.73.

Appropriate correction is required.

2. The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction

of the following is required: Claim 31 describes reporting a non-match if the prefix does not match an entry. However, the specification does not provide antecedent basis for this. Instead, the specification only describes "if rt_ptr_short is *non-null*, process 150 reports 162 no match" (p. 11, lines 5-6). This directly contradicts the claim language and does not provide sufficient antecedent basis for the claim language.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 28-35 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In considering claim 28, the phrase "the two trie tables of trees" on line 7 of the claim lacks sufficient antecedent basis and is thus ambiguous. The claim does not previously mention any "tables of trees" and thus the reference to tables of trees is unclear.

Claims 29-35 depend from claim 28 and are thus rejected as well.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –

> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 23-32 are rejected under 35 U.S.C. 102(e) as being anticipated by Lipman et al. (U.S. patent No. 6,192,051, hereinafter "Lipman").

In considering claim 23, Lipman discloses a memory for storing data for access by a longest prefix match program being executed on a data processing system (Fig. 2, "forwarding controller memory" on the "controller"), comprising:

A data structure stored in the memory, the data structure including information resident in a database ("routing database"; col. 7, lines 21-23) used by the longest prefix match program and including:

A large table at a root ("Level 1 routing entries"; col. 10, line 34), the root branching to nodes containing small trie tables ("level-2 routing entries"; col. 10, lines 61-62; Fig. 7), each trie table addressed by a span of IP address bits ("IP address bits [15:8]") to locate an indexed trie entry (col. 10, lines 39-46, 61-63), the indexed trie entry including a route pointer ("next hop address") and a trie pointer ("key"; col. 10, lines 39-46; col. 11, lines 5-14, wherein the next hop address points to a destination address and the key points to another trie table within the routing structure).

In considering claim 24, Lipman further discloses that the small trie tables each comprise prefix match fields for each indexed entry (i.e. "pointer values"; col. 11, lines 46-47), a population count of pointers (i.e. 256 level-2 entries, see Fig. 7), and hidden

prefix entries (col. 12, lines 40-50, describing pointers that only act as prefix entries when another pointer is deleted).

In considering claim 25, Lipman further discloses that the hidden prefix entries hold shorter prefix entry pointers (col. 12, lines 51-58, describing the shorter entry pointers being used when the longer pointer is deleted).

In considering claim 26, Lipman further discloses that the small trie tables are stored in SRAM (i.e. cache) and used for route lookups ("lookup"; col. 9, lines 49-51), route adds ("adds"), and route deletes ("deletes"; col. 12, lines 1-14, 40-50).

In considering claim 27, Lipman further discloses that the indexed trie entry is a 32-bit longword (col. 10, lines 54-56; Fig. 7, box 140, showing the 32-bit IP address).

Regarding claim 28, Examiner has interpreted the ambiguous claim language of "the two trie tables of trees" as meaning "the two trie tables."

In considering claim 28, Lipman discloses a method of searching a database for a prefix representing a destination address (col. 7, lines 21-41, "routing database... enable[s] the device 10 to make decisions regarding how packets received on a segment 20 or 22 are to be forwarded), comprising:

Reading a data structure stored in a memory, the data structure comprising a large table at a root ("level-1 routing entries"; col. 10, lines 55-57), the root branching to

two nodes containing small trie tables ("level-2 routing entries"; col. 10, lines 61-62; Fig. 7), each trie table addressed by a span of IP address bits ("IP address bits [15:8]") to locate an indexed trie entry (col. 10, lines 39-46, 61-63), the indexed trie entry including a route pointer ("next hop address") and a trie pointer ("key"; col. 10, lines 39-46; col. 11, lines 5-14, wherein the next hop address points to a destination address and the key points to another trie table within the routing structure); and

Traversing in parallel the two trie tables to find a match of a trie entry to the prefix (col. 14, lines 29-32, "there can be multiple lookups pending at a given time in the address resolution logic"; col. 16, lines 26-28, "comparison logic 192, and search control logic 194 of Fig. 9 are configured to compare the search key to four tree entries simultaneously").

In considering claim 29, Lipman further discloses that the route pointer represents the destination address ("next hop address") and the trie pointer points to a next small trie table ("key"; col. 10, lines 39-46; col. 11, lines 5-14, wherein the next hop address points to a destination address and the key points to another trie table within the routing structure).

In considering claim 30, Lipman further discloses that the small trie tables each comprise prefix match fields for each indexed entry (i.e. "pointer values"; col. 11, lines 46-47), a population count of pointers (i.e. 256 level-2 entries, see Fig. 7), and hidden

prefix entries (col. 12, lines 40-50, describing pointers that only act as prefix entries when another pointer is deleted).

In considering claim 31, Lipman further discloses reporting a non-match if the prefix does not match an entry (col. 12, lines 1-14, "if no such tree or trees exist, then new level-3 and/or level-2 trees are created for the new routing entry").

In considering claim 32, Lipman further discloses that a first large table is a single 64K entry table that is indexed by bits 31:16 of an IP address ("64k level 1 entries," "indexed by IP address bits [31:16]"; col. 10, lines 56-58).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 33-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lipman.

In considering claim 33, Lipman does not explicitly disclose that a second large table is indexed specifically by bits 31:24 of an IP address. However, Lipman does disclose that a second large table could be indexed by bits [31:20] and further suggests that "in alternative embodiments it may be desirable to shuffle the address fields with

respect to the levels" (col. 18, line 65 – col. 19, line 5). Thus, as evidenced by Lipman, the specific selection of bits for indexing each level is a matter of design choice, and it would have been obvious to include only bits 31:24 in the root table taught by Lipman (rather than bits 31:16 or 31:20) because fewer indexing bits at any particular level allows traversal through that level to either be faster or to use less memory.

In considering claims 34 and 35, Lipman further discloses that the small tables are dynamically allocated (i.e. added to or deleted from in real time, col. 12, lines 1-50) and comprise:

A tree with each node representing 16 bits of addresses covering an extension of 1-16 bits of a prefix entry from a previous tree (Fig. 7, node 40, for example). Again, although Lipman does not explicitly disclose that the nodes in the small tables represent 4 bits of address covering an extension of 1-4 bits of a prefix entry from a previous tree, Lipman discloses that it may be desirable to shuffle the address fields with respect to the levels. Here, it would have been desirable to shuffle the address fields in level one such that each node at the level-2 table covers only 4 bits of addresses, in order to simplify the level-2 and level-3 (or to even eliminate the need for the level-3) tables. Therefore, it would have been obvious for the small tables taught by Lipman to have nodes representing only 4 bits of addresses, instead of 16 bits.

Response to Arguments

Applicant's arguments with respect to claims 23-35 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Bradley Edelman whose telephone number is (703) 306-3041. The examiner can normally be reached on Monday to Friday from 8:30 AM to 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glen Burgess can be reached on (703) 305-4792. The fax phone numbers for the organization where this application or proceeding is assigned are as follows:

For all correspondences: (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-3900.

Bradley Edelman

BE
May 26, 2004